

# The truth about doctors' handwriting: a prospective study

Donald M Berwick, David E Winickoff

## Abstract

**Objective**—To determine whether doctors have worse handwriting than other health professionals.

**Design**—Comparison of handwriting samples collected prospectively in a standardised 10 seconds' task.

**Setting**—Courses on quality improvement.

**Subjects**—209 health care professionals attending the courses, including 82 doctors.

**Main outcome measures**—Legibility rated on a four-point scale by four raters.

**Results**—The handwriting of doctors was no less legible than that of non-doctors. Significantly lower legibility than average was associated with being an executive and being male. Overall legibility scores were normally distributed, with median legibility equivalent to a rating between "fair" and "good."

**Conclusion**—This study fails to support the conventional wisdom that doctors' handwriting is worse than others'. Illegible writing is, however, an important cause of waste and hazard in medical care, but efforts to improve the safety and efficiency of written communication must approach the problem systemically—and assume that the problems are in inherent in average human writing—rather than treating doctors as if they were a special subpopulation.

## Introduction

The assertion that doctors have bad handwriting holds an honoured place in traditional lore. According to conventional wisdom, doctors write in a code—a self righteous chicken scratch that is decipherable only by experienced pharmacists and, with luck, by each other. The question of doctors' handwriting, of course, has a serious side with far reaching implications concerning the quality and safety of health care. Some studies have found doctors' medical records and prescriptions illegible, wasteful, and dangerous,<sup>1-7</sup> but we found no evidence on whether poor handwriting is indeed more of a problem among doctors than among other adults. We gathered data on handwriting under controlled circumstances to determine if, among professionals in health care, being a doctor is associated with poorer handwriting.

## Methods and results

The subjects were a mix of healthcare executives, clinicians, and managers who were attending three different courses on quality improvement in health care. During a brief break period we asked participants while seated at a table to write on a blank piece of paper the

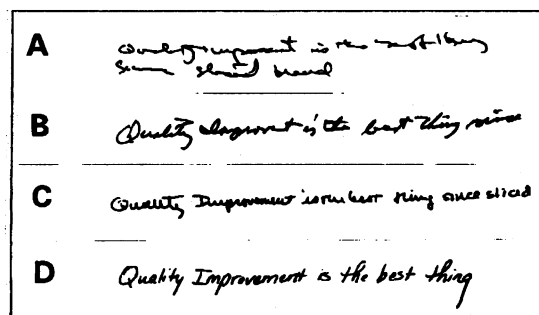


Fig 1—Representative writing samples with complete agreement on scores among four raters: sample A is poor (legibility score 1), B is fair (5), C is good (9), D is excellent (13)

following sentence: "Quality Improvement is the best thing since sliced bread." The participants were told to begin writing at the word "go" and were interrupted and told to stop after 10 seconds. Four volunteers, all non-clinicians, independently rated the legibility of each writing sample on a four-point scale: poor, fair, good, excellent. Raters were asked to use legibility as the rating criterion.

A total of 209 writing specimens was obtained. In these, 50 subjects had managed to write the complete challenge sentence, while 159 had not. Of the samples, 82 came from doctors, 32 from chief executives and chief operating officers (of whom 12 were doctors as well), 131 from men, and 139 from people aged 40 or older.

The rating scheme achieved a high level of inter-rater reliability, with pairwise correlation coefficients ranging from 0.60 to 0.76. Fig 1 shows four samples of writing on which all four raters agreed completely at each of the four levels of legibility. To calculate a summary rating, we simply added the four individual ratings for each sample and subtracted three points from the total, thus yielding a final legibility score between 1 (all four ratings "poor") and 13 (all four ratings "excellent"). The resulting range of legibility scores was approximately normal, with a mean rating of 7.15, a median of 7, and a standard deviation of 3.14.

The differences between means of the various groups were compared by the *t* test. By this test, the handwriting of doctors was no less legible than that of non-doctors. On average, the doctors scored 0.79 points less than non-doctors, an insignificant difference ( $P = 0.074$ ). In comparison, chief executives and chief operating officers averaged 2.87 points lower than non-executives, men averaged 2.25 points lower than women, and older subjects averaged 1.48 points lower than younger ones, all of which differences were statistically significant (table 1). Completing the challenge sentence (presumably an indication of faster writing) was also associated with a lower score.

## Discussion

In a simple, time limited handwriting task that may mimic the type of time pressure under which busy people in medical care work, doctors as a group did not write less legibly than other subjects. Why do so many believe that doctors have especially bad handwriting when in fact their writing may be quite average under the circumstances? One possible explanation is that average is, in absolute terms, "bad," and that the poor handwriting of doctors is riskier than the poor

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Table 1—Comparison of mean legibility scores by subject characteristic

Characteristic	Score of 1st group	Score of 2nd group	t	95% Confidence interval for difference between means	P
Doctors (n = 82) v non-doctors (n = 127)	6.67	7.46	-1.80	-1.65 to 0.058	0.074
Executives (n = 32) v non-executives (n = 177)	4.72	7.59	-6.18	-1.94 to -3.80	<0.0001
Men (n = 131) v women (n = 78)	6.30	8.58	-5.56	-1.47 to -3.09	<0.0001
Age >39 (n = 139) v age <40 (n = 70)	6.65	8.13	-3.33	-0.60 to -2.35	0.0011
Completed sample (n = 51) v failed to complete sample (n = 158)	5.65	7.63	-3.78	-0.94 to -3.03	0.0003

handwriting of non-doctors. The mean score in our study was 7.1 out of a possible 13 points, indicating that handwriting among the average subject, whether a doctor or not, lies somewhere between the two middle samples in fig 1. In medical circumstances, where the stakes are high, writing of this mediocre quality may be unacceptable.

If average handwriting is not acceptably safe or clear in medical care then we must seek ways either to "error proof" written communication or to reduce reliance on it. In the short run increasing individual's awareness and motivation may produce some minor gains. In the longer run, however, it may be more helpful to regard legibility as a systemic problem, not a personal one. Better physical designs, for example, might make it easier to write legibly. However, when the stakes are highest, safety may require not improving writing, but replacing it.

We have shown, in a study with an artificial task and high inter-rater reliability, that doctors have handwriting no worse than that of a comparison group of other healthcare personnel, and much better than that of healthcare executives. These findings in no way contradict lore and literature about the costs and hazards of

poor writing in prescriptions and medical records, but they do refocus the problem. Illegibility in medical care may have less to do with "bad" (that is, exceptionally bad) handwriting among doctors than with handwriting in general as a form of communication. More help may be found in computerisation<sup>8</sup> and other systemic innovations than in pointing the finger at a profession whose members, on the whole, write with an average hand.

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## Mizspellin and Medline

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Literature searches, whether conducted for patient care or for construction of a systematic overview, depend on at least two factors to be comprehensive. These are, firstly, use of an inclusive set of search strategies,<sup>1</sup> and, secondly, correct entry and referencing of published material within the database.<sup>2</sup> There is limited evidence on the accuracy of information within electronic databases. We assessed the accuracy of entries in Medline by searching for misspelt textwords.

### Methods and results

We conducted a literature search of 10 commonly used medical terms selected from the subject index of the *ACP Journal Club* (May/June 1996 issue).<sup>3</sup> We intentionally misspelt each term by altering one or two letters within the word (for example, myocardial infarction became myocardiial infraction). We searched for the terms as textwords in Medline from 1966 to November 1996 but did not use medical subject headings (MeSH). We analysed the number of times a misspelt term occurred within an article's title, abstract, or both and

the proportion of misspelt citations that might be missed if a search was conducted using only a textword search with the correctly spelt term.

### Results

Table 1 summarises the results of our misspelt searches. A total of 200 citations were retrieved from the 10 selected search terms. Most misspelt textwords occurred within the abstract only (141/200; 71%). Surprisingly, 98 of the 200 articles (49%) with misspelt textwords might be missed if you conducted a Medline search using the correctly spelt word alone without the MeSH heading.

### Comment

Although we did not evaluate the impact of adding proper MeSH headings to the above searches (assignment of MeSH headings is automated and thus they are never misspelt), we feel that a substantial proportion of minor articles on these subjects would be missed in a detailed systematic literature search.

Table 1—Results of Medline search using 10 misspelt textwords

Misspelt term (correct spelling)	No of misspelt citations retrieved	No (%) with misspelling in title alone	No (%) with misspelling in abstract alone	No (%) of potentially missed citations using textword search alone
Angima (angina)	3	2 (67)	1 (33)	1 (33)
Antibotics (antibiotics)	15	6 (40)	9 (60)	8 (53)
Asprin (aspirin)	13	5 (38)	8 (62)	7 (54)
Canzer (cancer)	0	0	0	0
Dopler (Doppler)	8	3 (38)	5 (63)	5 (63)
Cholestrol (cholesterol)	47	9 (19)	38 (81)	25 (53)
Hamorrhage (haemorrhage)	4	1 (25)	3 (75)	2 (50)
Myocardiial infraction (myocardial infarction)	96	22 (23)	71 (74)*	41 (43)
Spetic (septic)	10	5 (50)	5 (50)	7 (70)
Thrombolism (thromboembolism)	4	3 (75)	1 (25)	2 (50)
Total	200	56 (28)	141 (71)	98 (49)

\*Three articles contained misspelling within both the title and abstract.

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